November 13, 2017

Warm Up

Simplify the following:

$(3x^2y)^4 =$

$\left(\frac{3x}{y^2}\right)^{-1} =$

$4x^{-4}y(2x)^3 =$

$$power_2(8) = 3$$

$$power_2(32) = 5$$

$$power_3(9) = 2$$

$$power_3(81) = 4$$

$$power_5(25) = 2$$

$power_2(16) = \_\_\_\_\_$

$power_{10}\left(\frac{1}{1000}\right) = \_\_\_\_\_$

$power_6(36) = \_\_\_\_\_$

$power\_\_(81) = 2$

$power_5(\_\_\_\_\_) = 3$

$power\_\_(81) = 4$

$power_2(\_\_\_\_\_) = -1$

$power_{16}(\_\_\_\_\_) = \frac{3}{2}$

Def: A logarithm is an alternative way to write an exponent

1. $\log_2(32) = 5$ Say: log base 2 of 32 is 5

2. $\log_3(27) = 3$ Say: log base 3 of 27 is 3

3. Find $\log_2 16$

Why study logarithms?

Before the days of calculators, logs assisted in the process of multiplication and division {logs in essence converted these two operations to addition and subtraction}

They have applications in business, engineering, science, and economics.

- Number of payments on a loan or the time to reach an investment goal
- To model many natural processes
- Earthquake intensity on Richter scale

Underlying theory of logarithm function – has application to the decibel scale in acoustics

Here are some places to look for logarithms:

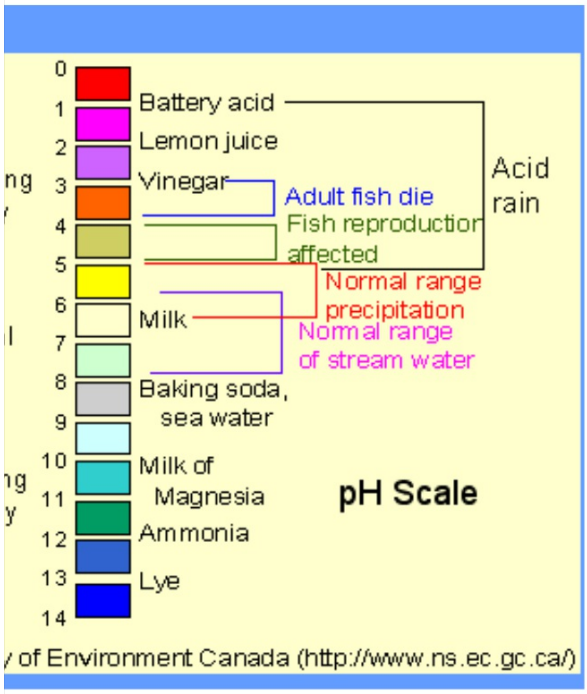
- Musical staff for notes. (distance vs. frequency) 

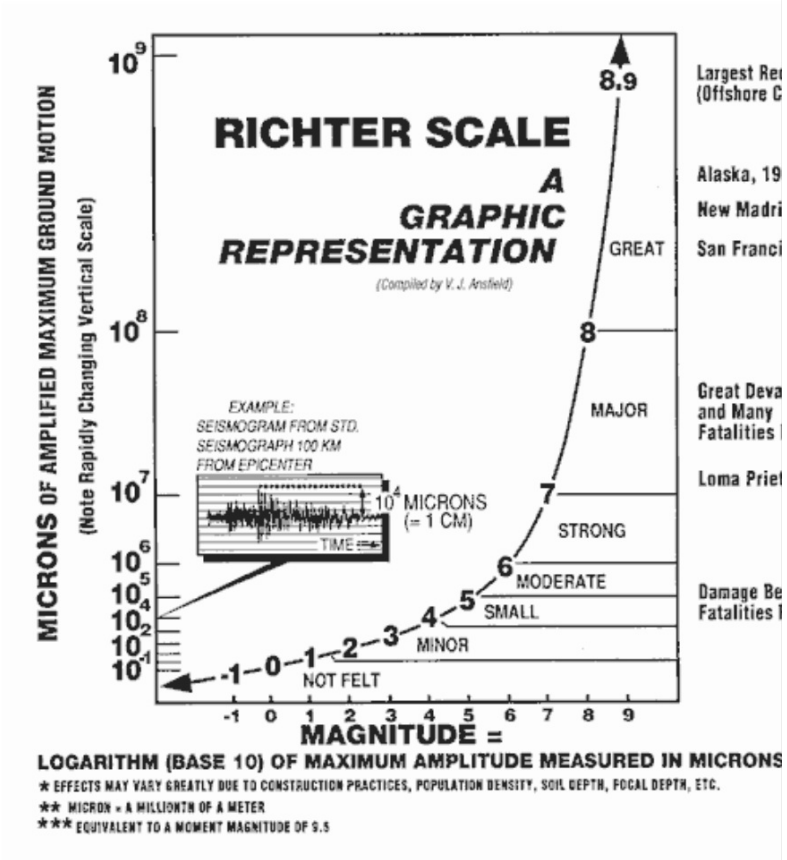
- Richter scale for earthquakes. (magnitude vs. energy) 

- Measurement of sound. (decibels vs. intensity) 

- Star magnitudes. (magnitude vs. brightness) 

- Cram studying. (amount forgotten vs. time) 


0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Battery acid
Lemon juice
Vinegar
Adult fish die
Fish reproduction affected
Acid rain
Normal range precipitation
Milk
Normal range of stream water
Baking soda, sea water
Milk of Magnesia
Ammonia
Lye
pH Scale
of Environment Canada (http://www.ns.ec.gc.ca/)


RICHTER SCALE
A GRAPHIC REPRESENTATION
(Compiled by V. J. Ansfield)
MICRONS OF AMPLIFIED MAXIMUM GROUND MOTION
(Note Rapidly Changing Vertical Scale)
EXAMPLE:
SEISMOGRAM FROM STD. SEISMOGRAPH 100 KM FROM EPICENTER
TIME
10^4 MICRONS (= 1 CM)
GREAT
MAJOR
STRONG
MODERATE
SMALL
MINOR
NOT FELT
8.9
MAGNITUDE =
LOGARITHM (BASE 10) OF MAXIMUM AMPLITUDE MEASURED IN MICRONS
★ EFFECTS MAY VARY GREATLY DUE TO CONSTRUCTION PRACTICES, POPULATION DENSITY, SOIL DEPTH, FOCAL DEPTH, ETC.
★★ MICRON = A MILLIONTH OF A METER
★★★ EQUIVALENT TO A MOMENT MAGNITUDE OF 9.5
Largest Re
(Offshore C
Alaska, 19
New Madri
San Franci
Great Deva
and Many
Fatalities
Loma Prie
Damage Be
Fatalities

Switching Forms:

$$\log_b N = x \qquad b^x = N$$

"log form" "exponential form"

4. Find $\log_5 1$

5. Find b : $\log_b(9) = 2$

6. Find N : $\log_8 N = -\frac{2}{3}$

$\log_{\text{base}}^{\text{answer}} = \text{exponent}$

$\text{base}^{\text{exponent}} = \text{answer}$

$b^x = a \iff \log_b a = x$

Find x: $10^x = 398$

Using logarithms to find unknown exponent:

using guess and check:

using logs:

$10^x = 398$ means

if no base is given in a log problem, it is 10!!!

$\log 4 = x \Rightarrow 10^x = 4$

$\log 4 = \log_{10} 4$

Write $2^5 = 32$ in log form

Write $8^{\frac{2}{3}} = 4$ in log form

Solve $\log_3 27$

Solve for b: $\log_b 32 = \frac{5}{2}$

Practice: Rewrite the following in logarithmic form:

1.) $8 = 2^3$

2.) $1/4 = 2^{-2}$

Rewrite the following in exponential form:

3.) $\log_2 32 = 5$

4.) $\log_2 1/2 = -1$

Practice:

Solve for x:

$\log_7 x = 2$

Solve for x:

$\log_3 x = -3$

Solve for x:

$\log_x 9 = 2$

Solve for x:

$\log x = -3$

Solve for x:

$\log_x 5 = 1/2$

November 14, 2017

Warm Up

Solve for x:

1. $\log 1000 = x$

2. $\log_5(1/25) = x$

3. $2 \cdot 3^x = 162$

L.T.: I can use logarithm properties to solve application problems

$$\log_a(m \cdot n) = \log_a m + \log_a n$$

$$\log_a\left(\frac{m}{n}\right) = \log_a m - \log_a n$$

$$\log_a(m^n) = n \cdot \log_a m$$

$\log_a 0$

$$x^m \cdot x^n = x^{m+n}$$

$$x^m / x^n = x^{m-n}$$

$$(x^m)^n = x^{m \cdot n}$$

$x^0 = 1$

L.T.: I can use logarithm properties to solve application problems

1.) log (ab)

2.) log a^2c

3.) log $\frac{a}{b}$

4.) log $\left(\frac{c^3}{b}\right)$

5.) log $\left(\frac{\sqrt{a}}{c^2}\right)$

6.) log $\left(\frac{\sqrt{bc}}{a}\right)$

$$\log_a(m \cdot n) = \log_a m + \log$$

$$\log_a\left(\frac{m}{n}\right) = \log_a m - \log_a n$$

$$\log_a(m^n) = n \cdot \log_a m$$

L.T.: I can use logarithm properties to solve application problems

Express as a single logarithm

8.) $2 \log b + 3 \log c$

9.) $2 \log a - 4 \log b$

10.) $\frac{1}{2} \log a + 2 \log c$

11.) $\frac{1}{2} (\log b - \log c)$

L.T.: I can use logarithm properties to solve application problems

The Highland Fish Company is starting a new line of frozen fish sticks. It will cost $19,000 to set up the production line and $1.75 per pound to buy and process the fish. They plan to sell the final product at a wholesale cost of $1.92 per pound.

Write a cost and an income fuction for this

L.T.: I can use logarithm properties to solve application problems

The Highland Fish Company is starting a new line of frozen fish sticks. It will cost $19,000 to set up the production line and $1.75 per pound to buy and process the fish. They plan to sell the final product at a wholesale cost of $1.92 per pound.

How many pounds will they have to sell before they start making a profit?

L.T.: I can use logarithm properties to solve application problems

The Highland Fish Company is starting a new line of frozen fish sticks. It will cost $19,000 to set up the production line and $1.75 per pound to buy and process the fish. They plan to sell the final product at a wholesale cost of $1.92 per pound.

How much profit can they expect to make on the first 500,000 pounds of fish?